

4-5: The student will demonstrate an understanding of the properties of light and electricity. (Physical Science)

Key Concepts

Properties of light: brightness, color

Forms of energy: light, electricity, heat, sound

When light strikes an object: reflection, refraction, absorption

Types of materials (with light): transparent, translucent, opaque

Complete circuit components: wire, switch, battery, light bulb

Electric current paths: series circuits, parallel circuits

Types of materials (with electricity): conductors, insulators

Properties of magnets and electromagnets: polarity, attraction, repulsion, strength

Supporting Content Web Sites

BBC

<http://www.bbc.co.uk/schools/podsmmission/electricity/>

This site includes an interactive circuit builder game and background information about circuits. (4-5.6, 4-5.7)

BBC

http://www.bbc.co.uk/schools/scienceclips/ages/7_8/magnets_springs.shtml

This website gives students the opportunity to experiment with magnetic attraction by seeing which types of objects are attracted to a magnet. An online quiz assesses basic concepts about magnetism. (4-5.9)

BBC

http://www.bbc.co.uk/schools/scienceclips/ages/8_9/circuits_conductors.shtml

This website gives students the opportunity to experiment with conductors and insulators by seeing which types of objects conduct electricity. An online quiz assesses basic concepts about conductors and insulators (4-5.8)

BBC

http://www.bbc.co.uk/schools/scienceclips/ages/10_11/changing_circuits.shtml

This website gives students the opportunity to investigate series and parallel circuits. An online quiz assesses basic concepts about circuits (4-5.7)

BBC

http://www.bbc.co.uk/schools/revisewise/science/physical/11_act.shtml

This site includes an interactive activity that examines properties of circuits, a fact sheet that includes basic concepts about circuits, and a quiz to assess student understanding. (4-5.6)

BBC

http://www.bbc.co.uk/schools/revisewise/science/physical/14_act.shtml

This site includes an interactive activity that examines properties of light, a fact sheet that includes basic concepts about light, and a quiz to assess student understanding. (4-5.1)

<http://www.andythelwell.com/blobz/>

The Blobz Guide to Electric Circuits is an interactive learning tool to explore electric circuits, conductors and insulators and parallel and series circuits. (4-5.6, 4-5.7, 4-5.8)

Kurtus Technologies

www.school-for-champions.com/science/electromagnetism.htm

This site describes how to make an electromagnet, how its magnetic field works, and how the strength of the magnet can be increased. (4.5-9, 4.5-10)

Optics Society of America

http://www.opticsforkids.com/optics_for_kids.html

This site contains a variety of lesson plans, experiments and games about light and optics. (4-5.3, 4-5.4)

Teacher's Lab of the Annenberg CPB Mathematics and Science Project

<http://www.learner.org/teacherslab/science/light/>

The activities on this site are designed to provide ideas about light and color and the properties of light. (4-5.1, 4-5.2, 4-5.3, 4-5.4)

Suggested Literature

Adamczyk, P. and Law, P. (1993) *Electricity and Magnetism*. New York, New York. Usborne Publishing Ltd.

ISBN 0-7460-0994-1

This book explores the properties of magnets and electricity and how they affect our everyday lives. (4-5.9, 4-5.10)

Aston, S. and Jackson, D. (2000). *Science Experiments With Light*. Danbury, CT: Franklin Watts.

ISBN 0-531-15429-7

This collection of light experiments is both attractive and child friendly. (4-5.1, 4-5.2, 4-5.3, 4-5.4)

Cole, J. and Degen, B. (1997). *Magic School Bus and the Electrical Fieldtrip*. New York. Scholastic, Inc.

ISBN 0-590-44682-7

Lexile AD490

Ms. Frizzle takes her class on a field trip through the town's electrical wires so they can learn how electricity is generated and how it is used. (4-5.5)

DeMauro, L. (2005). *Thomas Edison: A Brilliant Inventor*. New York, New York.

HarperCollins Children's Books

ISBN 0-06-057612-X

This book contains fascinating illustrations and fun sidebars about inventions and inventors. This is a biography which highlights Edison's work with electricity and the light bulb (4-5.5)

Hamilton, G. (2004). *Light: prisms, rainbows and colors*. Chicago, IL: Raintree.

ISBN: 0739869957

Introduces the basic features of light energy and how it can be used in optics and lasers. (4-5.1, 4-5.2, 4-5.3, 4-5.4)

Marson, R. (2000). *Magnetism*. Canby, OR: TOPS Learning Systems.

ISBN 0-941008-54-1

This is a collection of 20 magnetism activities using simple classroom and household materials. (4-5.10)

Oxlade, C. (2000). *Electricity and Magnetism*. Chicago, IL: Heinemann.

ISBN: 075024710X

This book explores various aspects of magnetism and electricity including static electricity, conductors, insulators, circuits, electromagnets and movement with magnets. (4-5.9)

Riley, P. (1998). *Straightforward Science: Electricity*. Danbury, CT: Franklin Watts.

ISBN 0-531-15366-5

This is a straightforward, child friendly introduction to key concepts of electricity. Clear photographs and diagrams complement the text. (4-5.5, 4-5.6, 4-5.7, 4-5.8)

Riley, P. (1998). *Straightforward Science: Light and Color*. Danbury, CT: Franklin Watts.

ISBN 0-531-15371-1

This is a straightforward, child friendly introduction to key concepts of light and color. Clear photographs and diagrams complement the text. (4-5.1, 4-5.2, 4-5.3, 4-5.4)

Wood, R. (1997). *Electricity and Magnetism*. New York, New York. McGraw Hill.

ISBN 0-07-071805-9

This book contains experiments that explore electricity, magnetism, and the relationship between the two. (4-5.9, 4-5.10)

Suggested Streamline Video

Electricity: A First Look

ETV Streamline SC

Segment 7: Conductors and Insulator

Shows types of objects and demonstrates if they are conductors or insulators. The important roles of insulators for safety are discussed. (4-5.8)

9:46 to 10:45

Electricity and Magnetism: Magic of Magnets

ETV Streamline SC

Segment 3: Electromagnets

Describes the discovery of electromagnets and how electromagnets are made. The science behind electromagnets is also examined. (4-5.10)

7:39 to 10:11

Segment 4: Electricity from Magnetism

This segment provides a historical background of the discovery of electricity from magnets. The segment also shows how electricity can be created from magnetism and the applications of this process. (4-5.9)

10:12-11:56

Getting to Know Electricity

ETV Streamline SC

Segment 7: Series and Parallel

The segment demonstrates a series and parallel circuit and describes similarities and differences. (4-5.7)

7:53 to 8:29

Segment 8: Electromagnetism

This segment shows the relationship between electricity and magnetism to create electromagnets. (4-5.9)

8:30 to 10:45

Junior Electrician: Current Electricity

ETV Streamline SC

Segment 1: Introduction

This segment gives many examples of the ways in which electricity is used and how energy transformation powers every day objects. (4-5.5)

0:00 to 1:25

Segment 4: Circuits

Shows an example a circuit and also describes conductors and insulators. (4-5.6, 4-5.8)

6:08 to 8:03

Segment 6: Electromagnets

Provides a demonstration of how an electromagnet is made. (4-5.9, 4-5.10)

9:56 to 11:09

Out of Darkness: An Introduction to Light

ETV Streamline SC

Segment 1: An Introduction to Light

The segment focuses students' attention on light and poses questions for students to consider during their study. For example: Why do we see color? Why do we see ourselves in a mirror? What makes a rainbow? (4-5.1, 4-5.2, 4-5.3)

0:00 to 1:10

Segment 3: Light has Energy

The segment addresses light as a form of energy. (4-5.1)

6:48 to 8:34

Segment 5: Transparent and Opaque Materials

The segment defines transparent and opaque and includes examples of each. (4-5.4)

11:00 to 11:49

Segment 6: Reflection and Luminosity

The segment focuses on how light behaves when it strikes an opaque object, discussing shadows, sources of light, and reflected light (4-5.4)

11:50 to 15:05

Segment 7: Refraction

This segment focuses on how light behaves when it passes through one transparent material to another

15:06 to 17:13

Segment 10: Color

The segment reviews the use prisms to separate white light and explains in simple terms why we see different colors. (4-5.2)

19:38 to 21:00

Career Connections**Astronomer**

An astronomer uses telescopes to gather more light than the naked eye and to make distant objects brighter and more visible. This information can be used to learn more about the solar system. (4-5)

Electrician

An electrician installs, maintains, and repairs electrical wiring, equipment, and fixtures. They use their knowledge of circuits to make sure that all the electric wiring in your house is safe and does not catch fire. They also will “string” wires from an electric generating plant to give electric power to houses, schools and businesses. (4-5)

Electrical Engineer

An electrical engineer designs, develops, and tests the manufacturing and installation of electrical equipment, components, or systems. An electrical engineer may work in industry, the military or in scientific research. (4-5)

Optometrists

Optometrists, also known as *doctors of optometry*, or *ODs*, provide most primary vision care. Optometrists prescribe eyeglasses and contact lenses. Optometrists use their knowledge of light and color to diagnose diseases of the eye. (4-5)

Scientific Illustrators

Scientific illustrators are artists that use their knowledge of light and color to draw illustrations of animal and plant life, atomic and molecular structures, and geologic and planetary formations. Scientific illustrators combine the skills of drawing with their scientific knowledge. The illustrations they create are used in medical and scientific publications and in audiovisual presentations for teaching purposes. (4-5)